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DOCUMENTATION OF REVISIONS (PROPOSED)

TO

LOUISIANA ADMINISTRATIVE CODE
TITLE 33
ENVIRONMENTAL QUALITY
Part IX. Water Quality Regulations
Chapter 11
LOUISIANA SURFACE WATER QUALITY STANDARDS

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL ASSESSMENT
WATERSHED ASSESSMENT DIVISION
2006

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CHAPTER ONE
DOCUMENTATION FOR PROPOSED TRIENNIAL REVISION
TO THE 2006 LOUISIANA SURFACE WATER QUALITY STANDARDS

<i>Section</i>	<i>Comment</i>
Chapter 11.	Louisiana Surface Water Quality Standards
§1101.	Introduction. C. This section was deleted because it contains historical information that is not relevant to the current Triennial Revision. The historical information will be kept as either a stand-alone record or it will be incorporated into another document, such as the Documentation of Proposed Revisions to LAC 33:IX, Chapter 11 Louisiana Surface Water Quality Standards.
§1103.	Authorization. No changes are being submitted at this time.
§1105.	Definitions Minor grammatical corrections were made throughout the section. These corrections are not detailed in this document, but are noted (by the strikeout/underline format) in the proposed regulations. The following definitions have been revised for reasons other than grammar, spelling, or diction: <i>Acute Toxicity</i> - Revised to define “short-term” exposure <i>Artificial Heat</i> -Added as a change of terminology to be consistent with other chapters of the LAC, previously known as <i>process heat</i> <i>Clean Techniques</i> -Revised to reflect the meaning of the phrase as it pertains to LDEQ. This definition was derived from the QAPP, <i>Trace Metals Monitoring in Louisiana Surface Waters Using Clean Sampling and Analysis Techniques</i> . <i>Fresh Warmwater Biota</i> – Revised to clarify the salinity range difference between fresh, brackish, and marine waters <i>Intermittent Streams</i> – Revised to be more general and consistent with the use of the term <i>Man-made Water Body</i> —Formerly defined as <i>Man-made watercourse</i> , this term was changed to be consistent with the text of §1109.C; revised to specifically define the characteristics of a man-made water body <i>mg/L</i> – revised to define the units used in Chapter 11; <i>ppm</i> , <i>ppb</i> , and <i>ppt</i> are no longer used as units in the Chapter <i>ng/L</i> - revised to define the units used in Chapter 11; <i>ppm</i> , <i>ppb</i> , and <i>ppt</i> are no longer used as units in the Chapter The following definitions were added to clarify their use in Chapter 11. <i>Background Condition</i> <i>Brackish water</i> <i>Estuary</i> <i>Excepted Use</i> <i>Fresh water</i> <i>g/L</i> <i>Harmonic Mean Flow</i> <i>Marine water</i> <i>Water Body Exception Classification</i>

The following definitions were removed. No references to these terms currently exist in Chapter 11.

Assimilation Capacity
Biological Succession
Brackish Marshes
Freshwater Swamps and Marshes
Intermediate Marshes
Marine Water Biota
Receiving Waters
Process Heat
Saline Marshes
Ultra-clean techniques

§1107. Enforcement.

No changes are being submitted at this time.

§1109. Policy.

C. Water Body Exception Classification – The terms “classification” and “category” were used interchangeably throughout the text. For consistency, the term “classification” was chosen at the recommendation of the Regulations Development editor and, the text was revised accordingly. Redundant and unnecessary language were removed and/or revised for clarification.

§1111. Water Use Designations Definitions.

The format of this section was revised according to LDEQ’s Regulation Development standards. The revisions also include minor grammatical corrections.

§1113. Criteria.

C.6.b. Language was added to clarify the application of marine and freshwater criteria in brackish areas.

C.6.d. Language was added to clarify the application of marine and freshwater criteria in brackish areas.

C.6.f. The terms “clean techniques” and “ultra-clean techniques” are not distinguished as separate collection methods in LDEQ’s Quality Assurance Project Plans (QAPPs), approved by EPA Region 6. All references to the term “ultra-clean techniques” were removed.

For consistency and ease of use, Table 1, Numerical Criteria for Specific Toxic Substances, was reformatted. All toxic substances were placed in alphabetical order and all numerical criteria were converted to the same units (ug/L). Metals criteria and criteria equations were moved to Table 1A. To minimize confusion by users, the “example” hardness-based criteria were removed from the table, and replaced with the actual equations. Additionally, to prevent miscalculation, the conversion factors and equations were placed in the table, now appearing as an integral part of criteria and hardness-based criteria calculations. The footnotes were revised accordingly. Columns were added in Tables 1 and 1A for brackish water criteria, which supports the changes proposed in sections C.6.b and C6.d.

Footnote 11 was removed as LDEQ’s monitoring program does not include sampling for several consecutive days. The averages are also not required for assessment purposes. Mercury is currently monitored quarterly as part of LDEQ’s ambient Water Quality Network.

§1115. Application of Standards.

A.2 To eliminate confusion of the application of water quality criteria, the term “maximum” in reference to general and numerical criteria has been removed. Maximum numbers do not apply to all types of criteria (e.g. narrative or criteria where minimum numbers are applied, such as pH and dissolved oxygen).

C.8 The terms “chlorides” and “sulfates” have been changed to “chloride” and “sulfate”, which are the correct grammatical terms.

§1117. References.

No changes are being submitted at this time.

§1119. Implementation Plan for Antidegradation Policy

Throughout the entire section, the phrase “Louisiana Water Quality Inventory” has been replaced with “Louisiana Water Quality Integrated Report,” which is the current name of the biennial report required by Section 305(b) of the Clean Water Act. In Section B.2 the phrases “Water Quality Management Plan” and “Water Pollution Control Program Plan” were removed. The documents listed are components of the “Water Quality Management Plan”, which is not a stand-alone document. The “Water Pollution Control Program Plan” is not a current document.

§1121. Regulation of Toxic Substances Based on the General Criteria.

B.4 Minor grammatical changes are being submitted, per LDEQ’s Regulations Development editor.

§1123. Numerical Criteria and Designated Uses.

C.2 Language was added to clarify the use of the Bacteria Codes in Table 3.

Table 3. Numerical Criteria and Designated Uses. Three primary types of changes have been made to Table 3:

- 1) All subsegment descriptions were reviewed for grammatical and geographical correctness, and the language was standardized according to internal language guidelines (see Appendix A).
- 2) The Source Water Assessment Staff conducted a review of all public/community drinking water intakes and identified subsegments that currently have surface water intakes, but are not designated as a drinking water source.

DWS has been added as a designated use for the following subsegments:

010502 – Intracoastal Waterway
010701 – Bayou Teche
060601 – Charenton Canal
070103 – Marengo Bend¹
100703 – Black Lake and Clear Lake
100709 – Grand Bayou
120109 – Intracoastal Waterway

The subsegments were created in order to account for the drinking water intake:

081601-556716 – Georgetown Reservoir²

¹ The boundaries of subsegment 070103 were redefined during this Triennial Revision. The original boundary lines were developed using inaccurate mapping tools, which resulted in subsegment 070103 to be located within the state of Mississippi. The boundaries have been revised so that only the portion of Marengo Bend that lies within Louisiana is considered 070103.

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030806-554700 – Houston River Canal³

- 3) The Water Quality Standards staff solicited comments from LDEQ Surveillance and Water Quality Modeling (TMDL) staff. Several recommendations were received to modify subsegment delineations, including deletions and additions. The WQS staff reviewed each recommendation and determined the following delineation changes were necessary and within the scope of this Triennial Revision:
- a. Subsegment 101503 (Old Saline Bayou) was deleted and the primary portion of the subsegment was absorbed into 101505 (Larto Lake), with minor portions being absorbed into 101504 (Saline Bayou). The majority of the area, previously considered subsegment 101503, is encompassed by a levee and consists of intermittent streams with one outlet, draining into Larto Lake. The most stringent criteria of the two subsegments are proposed for this subsegment.
 - b. The boundary dividing subsegments 030806 (Houston River) and 030807 (Bearhead Creek) was moved to LA-10. The previous boundary line was created using inaccurate mapping tools and the line did not fall at the actual junction of 030806 and 030807. USGS 1:24000 quad maps were used to determine the correct boundary line.
 - c. Subsegment 080402 (Bayou Bartholomew) was deleted and that portion absorbed into 080401. This subsegment was previously created to separate the scenic portion of Bayou Bartholomew from the non-scenic portion. However, subsegment 080402 (not scenic) was 500 yards long and there is no change in hydrology or geography to differentiate this portion from the upper reach of 080401, which extends from the Arkansas State Line to Dead Bayou. The “Scenic” portion of 080401 still remains to Dead Bayou and will be accounted for using the NHD Indexing method. The most stringent turbidity criteria (25 NTU) will be applied to the entire subsegment.
 - d. The boundary between subsegments 020907 and 021001 was redefined. Coastal land loss has changed the land/water proportions and characteristics. The line was redrawn based on the remnant land boundary. The descriptions in Table 3 were revised accordingly. The pH criteria differed between the two subsegments. A review of the ambient water quality data revealed no significant difference in the pH between the two subsegments, and thus, the more stringent of the two criteria (6.0-8.5) is proposed for both subsegments.
 - e. The boundary between 120302 and 120304 was redefined. The name of subsegment 120302 was changed to “Bayou Folse”, as it is perennial, and has always been the water body monitored and assessed for this subsegment. The boundary line was redefined to include Company Canal in subsegment 120304.
 - f. The boundary between subsegments 040403 and 040404 was redefined according to the hydrology of the watershed. The original line was incorrectly drawn and cut across several streams. Subsegment 040404 now includes New River Canal to the Petite Amite River.
 - g. Subsegment 050102 was absorbed into subsegment 050101. Subsegment 050102 is a small tributary of 050101 with the same designated uses and criteria. There is no need to maintain separate subsegments.
 - h. Subsegment 050302 was absorbed into subsegment 050301. Subsegment 050302 (Beaver Creek) is a small, intermittent tributary of 050301. The intermittent portion of the stream will be defined using the NHD Indexing technique. The intermittent status of Beaver Creek and the criteria that apply are maintained in footnote number 2.

² Georgetown Reservoir, previously located within subsegment 081601 (Little River), receives no drainage from the rest of the Little River subsegment. LDEQ chose to designate Georgetown Reservoir as a separate subsegment. The last six numbers of the subsegment are the GNIS (Geographic Names Information System) numbers of the water body, which are used to identify very small subsegments.

³ Houston River Canal, previously located within subsegment 030806 (Houston River), receives no drainage from the Houston River. LDEQ chose to designate Houston River Canal as a separate subsegment. The last six numbers of the subsegment are the GNIS (Geographic Names Information System) numbers of the water body, which are used to identify very small subsegments.

CHAPTER TWO

HUMAN HEALTH NUMERICAL CRITERIA DERIVATIONS FOR TOXIC SUBSTANCES

The development of numerical criteria for human health protection follows guidance established by the Environmental Protection Agency (EPA). This guidance is established in a series of EPA documents including publications in the Federal Register. Some of the more important EPA documents which discuss the development of numerical human health criteria are listed in the reference section of this document. The approach used in developing the human health criteria for the Louisiana Water Quality Standards was originally described in a Documentation Report for the 1989 Louisiana Water Quality Standards, prepared by the Louisiana Department of Environmental Quality, Office of Water Resources (LDEQ-OWR) in June 1989 (also on file at EPA). **There are significant changes to the human health criteria, and the proposed changes are highlighted in Table 1 and Table 3 below.** The human health criteria was recalculated for the following compounds: PCBs (polychlorinated biphenyls), benzene, vinyl chloride, bromodichloromethane, and 1,3-dichloropropene. The most recent calculation factors were obtained from EPA's IRIS (Integrated Risk Information System) and the following two documents: 1) EPA-822-R-02-012, *National Recommended Water Quality Criteria: 2002* 2) EPA-822-F-03-012, *Revised National Recommended Water Quality Criteria*.

NUMERICAL CRITERIA FOR HUMAN HEALTH STANDARDS

While updated BCFs (biconcentration factors), RfDs (reference doses), and SFs (cancer potency slope factors) have been used to recalculate human health criteria for some compounds, no calculation methods have been changed during this Triennial Review. The following equations were used in accordance with LDEQ's Standard Operating Procedure for Human Health Criteria Calculation:

1) The equation for a carcinogen chemical in waters designated as public water supply is:

$$(10^{-6})(70 \text{ kg})$$

$$\text{Criteria mg/L} = \frac{\text{SF}[0.089 \text{ L/day} + 2 \text{ L/day} + (\text{BCF})(0.02 \text{ kg/day})]}{}$$

2) The equation for a non-carcinogen chemical in waters designated as public water supply:

$$\text{RfD} \times 70 \text{ kg}$$

$$\text{Criteria mg/L} = \frac{\text{RfD} \times 70 \text{ kg}}{[0.089 \text{ L/day} + 2 \text{ L/day} + (\text{BCF})(0.02 \text{ kg/day})]}$$

3) The equation for a carcinogen chemical in waters not designated as public water supply is:

$$(10^{-6})(70 \text{ kg})$$

$$\text{Criteria mg/L} = \frac{\text{SF}[(10^{-6})(70 \text{ kg})]}{[0.089 \text{ L/day} + (\text{BCF})(0.02 \text{ kg/day})]}$$

4) The equation for a non-carcinogen chemical in waters not designated as public water supply is:

$$\text{RfD} \times 70 \text{ kg}$$

$$\text{Criteria mg/L} = \frac{\text{RfD} \times 70 \text{ kg}}{[0.089 \text{ L/day} + (\text{BCF})(0.02 \text{ kg/day})]}$$

5) The equation for a carcinogen chemical in non-drinking water supply with no swimming use is:

$$(10^{-6})(70 \text{ kg})$$

$$\text{Criteria mg/L} = \frac{\text{SF}[(10^{-6})(70 \text{ kg})]}{\text{SF}[(\text{BCF})(0.02 \text{ kg/day})]}$$

6) The equation for a non-carcinogen chemical in non-drinking water supply with no swimming use is:

$$\text{Criteria mg/L} = \frac{\text{RfD (70 kg)}}{(\text{BCF}) (0.02 \text{ kg/day})}$$

The factors used for the derivation of Louisiana's current human health criteria are presented in Table 1 below. **Factors that were changed based upon the EPA documents (referenced above) are highlighted.** Also, Table 2 lists Organoleptically Derived Chemical Criteria and Table 3 lists Chemicals with Criteria based on Maximum Contaminant Levels (MCLs).

TABLE 1. RISK-BASED HUMAN HEALTH CRITERIA

Chemical	BCF	SF or (Rfd) ⁴	Drinking Water Supplies Criteria (µg/L) ⁵	Non-Drinking Water Supplies Criteria (µg/L) ⁶	Cancer Group
Aldrin	4,670	17	4x10 ⁻⁵	4x10 ⁻⁵	B2 ⁷
Chlordane	14,000	1.3	1.9x10 ⁻⁴	1.9x10 ⁻⁴	B2
DDT	53,600	0.34	1.9x10 ⁻⁴	1.9x10 ⁻⁴	B2
TDE (DDD)	53,600	0.24	2.7x10 ⁻⁴	2.7x10 ⁻⁴	B2
DDE	53,600	0.34	1.9x10 ⁻⁴	1.9x10 ⁻⁴	B2
Dieldrin	4,670	16	5x10 ⁻⁵	5x10 ⁻⁵	B2
Endosulfan	270	(0.00005)	0.47	0.64	-- ⁸
Endrin	3,970	(0.0003)	0.26	0.26	--
Heptachlor	11,200	4.5	7x10 ⁻⁵	7x10 ⁻⁵	B2
Lindane	130	1.3	0.11	0.20	B2
PCBs	31,200	2	5.59 x 10⁻⁵	5.61 x 10⁻⁵	B2
Toxaphene	13,100	1.1	2.4 x 10 ⁻⁴	2.4 x 10 ⁻⁴	B2
2,4-D	---	---	100.0 (MCL)	---	---
2,4,5-TP; Silvex	---	---	10.00 (MCL)	---	---
Benzene	5.2	0.055⁹	0.58	6.59	A ¹⁰
Carbon Tetra-chloride	18.75	0.13	0.22	1.2	B2
Chloroform	3.75	0.0061	5.30	70.0	B2
Ethylbenzene	37.5	(0.097)	2,390	8,100	D ¹¹

⁴ Slope factors are used with known carcinogens; reference doses (Rfd) are used with non-carcinogens and placed in parentheses.

⁵ Public water supplies criteria are applicable to waters designated for Drinking Water Supply (DWS).

⁶ Non-drinking water criteria are applicable to waters not designated for DWS, but designated for Fish and Wildlife Propagation (FWP) and Primary Contact Recreation (PCR).

⁷ Probable human carcinogen.

⁸ Not categorized for human carcinogenicity.

⁹ Current slope factor is a range. The most stringent calculation was used.

¹⁰ Human carcinogen.

¹¹ Possible human carcinogen.

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Chemical	BCF	SF or (Rfd) ⁴	Drinking Water Supplies Criteria (µg/L) ⁵	Non-Drinking Water Supplies Criteria (µg/L) ⁶	Cancer Group
1,2-Dichloroethane	1.2	0.091	0.36	6.8	B2
1,1,1-Trichloroethane	---	---	200 (MCL) ¹²	---	---
1,1,2-Trichloroethane	4.5	0.057	0.56	6.9	C ¹³
1,1,2,2-Tetrachloroethane	5	0.2	0.16	1.8	C
1,1-Dichloroethylene	5.6	0.6	0.05	0.58	C
Trichloroethylene	10.6	0.011 ¹⁴	2.8	21	B2
Tetrachloroethylene	30.6	0.039776	0.65	2.5	B2
Toluene	10.7	(0.2)	6,100	46,200	D
Vinyl Chloride	1.17	1.4	2.37 x 10⁻²	0.45	A
Bromoform	8.3	0.0079	3.9	34.7	B2
Bromodichloromethane	3.75	0.062	0.52	6.88	B2
Methylene Chloride	0.91	0.0075	4.4	87	B2
Dibromochloro- methane	3.75	0.084	0.39	5.08	B2
1,3-dichloropropene	1.9	(0.1)	0.33	5.51	B2
2-Chlorophenol	134	(0.005)	0.10	126.4	--
2,4-Dichlorophenol	40.7	(0.003)	0.30	232.6	--
Benzidine	87.5	230	8 x 10 ⁻⁵	1.7 x 10 ⁻⁴	A
Hexachlorobenzene	8,690	1.6	2.5 x 10 ⁻⁴	2.5 x 10 ⁻⁴	B2
Hexachlorobutadiene	392	0.078	0.09	0.11	C
Phenol (total)	---	---	5.0 ¹⁵	50	---
Cyanide ¹⁶	1.0	(0.02)	663.8	12,844	---
2,3,7,8-Tetrachlorodibenzo-p-dioxin ¹⁷	5000	9700	7.1 x 10 ⁻⁸	7.2 x 10 ⁻⁸	---

¹² The criteria for public drinking water supplies based on an MCL (SF for 1,1,1-trichloroethane was withdrawn from IRIS during 1992-1993).

¹³ Possible human carcinogen

¹⁴ Under review by EPA.

¹⁵ The phenol drinking water criteria for human health protection is based upon the USGS alert limit. Criteria calculated based on toxicity are much higher than the organoleptic criteria supported by the EPA in the criteria document for phenol. At the time this standard was adopted, the level was within one standard deviation of ambient background levels for phenol in the Mississippi River, but on a nationwide basis, 80-85% of ambient values for phenol were lower than this level.

¹⁶ According to IRIS, cyanide is non-carcinogenic and not bioaccumulative but is acutely toxic despite its capacity to be readily metabolized by living things. These criteria are also based on a fish consumption rate of 20 g/day established from two studies conducted during 1991 and 1993 in Louisiana.

¹⁷ Risk level of 10⁻⁵ is used to derive criteria; also exposure pathway for dioxin is unique (LDEQ, October 1991 Triennial Revision documentation).

ORGANOLEPTIC CRITERIA

Organoleptic data is used to establish water quality criteria in drinking water supplies for certain chemicals for which sufficient data regarding toxicity and carcinogenicity is not available. This method is limited and has no demonstrated relationship to potential adverse human health effects, but is set at a level to control undesirable taste and odor in ambient water. Table 2 is a list of chemicals whose criteria are based on organoleptic data:

TABLE 2. CHEMICALS WITH ORGANOLEPTICALLY DERIVED CRITERIA (ug/L)

3-chlorophenol	0.10
4-chlorophenol	0.10
2,3-dichlorophenol	0.04
2,5-dichlorophenol	0.50
2,6-dichlorophenol	0.20
3,4-dichlorophenol	0.30

MCL CRITERIA

Some human health criteria for surface waters are based on finished drinking water standards under the Safe Drinking Water Act (Table 3). Maximum contaminant level (MCL) criteria are set for public health, and take into consideration slightly different factors than are considered for surface water criteria. Based on the statutory directive for setting the MCLs, EPA derives the MCLs based on an evaluation of (1) the availability and performance of various technologies for removing the contaminant, and (2) the costs of applying those technologies. Other factors considered in determining the MCL include the ability of laboratories to measure accurately and consistently the level of the contaminant with available analytical methods. For carcinogens, EPA also evaluates the health risks that are associated with various levels of the contaminants with the goal of ensuring that the risks at the MCL fall within the 10^{-4} to 10^{-6} risk range that the Agency considers protective of public health and therefore achieves the overall purpose of the Safe Drinking Water Act. An MCL is only used as an in stream standard in situations where the water body is designated as a public drinking water supply. **In accordance with the Federal Register: Volume 66, Number 14 (pp. 6975-7066), the Arsenic MCL is proposed to be lowered from 50 ug/L to 10 ug/L. The human health criteria (in LAC 33. IX.1113, Table 1) for drinking water sources has been modified accordingly.**

TABLE 3. CHEMICALS WITH CRITERIA BASED ON MCLs (ug/L)

1,1,1-trichloroethane	200
Chromium III	50
Chromium VI	50
Cadmium	10
Lead	50
Mercury	2
Arsenic ¹⁸	10
2,4-D	100
2,4,5-TP	10
Copper	1,000
Zinc	5,000

¹⁸ For arsenic, Louisiana uses a MCL as one of the EPA-recommended options until the carcinogenicity and toxicity of arsenic in the food chain (i.e., fish tissue) is resolved.

ACUTE AND CHRONIC AQUATIC LIFE PROTECTION

Aquatic criteria for toxic chemicals listed with a "National" criteria type in Table 4 were directly available from EPA and suitable for the protection of aquatic species in Louisiana. Numerical criteria for aquatic life protection for some toxic substances were not directly available from EPA and were derived using application factors and LC50 data (Table 4) as presented in EPA documents.¹⁹ To derive a criterion value, an application factor^{20,21} was multiplied by the lowest reported LC50 value for a representative Louisiana species listed in the EPA criteria documents. This approach was developed in cooperation with Region VI EPA²². For nonpersistent or nonaccumulative toxic substances, an application factor of 0.1 was used for acute protection and 0.05 for chronic protection. For persistent or cumulative toxic substances, an application factor of 0.05 was used for acute protection and 0.01 was used for chronic protection. The use of application factors provides a safety consideration to protect all life stages of a test species as well as to protect associated species that have not been tested and may be more sensitive to the tested toxic substance. National criteria for certain chemicals are inappropriate for Louisiana because toxicity data for sensitive species not found in Louisiana greatly skewed the national criteria. In some instances, species not found in Louisiana were deleted from the database, and criteria more appropriate to this state were recalculated in accordance with EPA-recommended procedures. The calculation procedure for acute and chronic aquatic life protection in Louisiana's water quality standards is further documented in "Procedures for Aquatic Life Criteria Calculation in Louisiana."²³

Numerical criteria for fresh and marine water aquatic life for metals were updated in LDEQ's 1991 revision of the 1989 triennial. All criteria were taken from the ambient criteria recommendations of the EPA with the exception of cadmium and copper.^{24,25,26} Cadmium and copper criteria values were obtained from recalculations of EPA data to produce criteria more appropriate for Louisiana by eliminating species not known to occur in the state.²⁷ The recalculations were made by EPA Region 6 staff according to EPA guidelines. Recalculations of other metals criteria were evaluated but not found to be significantly different from EPA national values, and therefore, EPA values were used. The EPA Ambient Water Quality Criteria for nickel was updated in the 1986 document²⁵ from the 1984 EPA Ambient Water Quality Criteria series, which is the source of the EPA's Gold Book values. The marine water criterion for lead was revised by EPA from the criterion in the 1986 Ambient Water Quality Criteria series. When EPA was reviewing the criteria documents to ensure that appropriate numbers were included in the [then] proposed National Toxics Rule, EPA discovered a typographical error in the document. It was an error in transcribing units from the laboratory sheets. Instead of the LC50 for one organism being reported in mg/l, it was listed as µg/l. The correction of this error resulted in an EPA-recommended recalculation of the marine criterion for lead, which was adopted by Louisiana during the 1993 triennial revision.

Freshwater aquatic life criteria were updated during the 1998 Triennial Revision for Dieldrin, Endrin, and Arsenic in accordance with the "1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, September 1996." The updates utilized new data considered by EPA to be of acceptable quality along with data in the criteria documents previously published by the EPA. New data are data that became available since the last literature search used in the preparation of the criteria documents by EPA and prior to January 1993. The recommendations for these criteria are also found in the National Recommended Water Quality Criteria: Republication (63 FR 68354 published on December 10, 1998; and corrections published on April 22, 1999).

¹⁹ EPA, 1980. Ambient water quality criteria. EPA series 440/5-80.

²⁰ EPA, 1972. Water quality criteria, p. 123.

²¹ EPA, 1976. Quality criteria for water, p. 2-3.

²² LDEQ, 1989. Documentation of numerical criteria for acute and chronic aquatic life protection in the 1989 water quality standards revision. Office of Water Resources, Water Pollution Control Division.

²³ LDEQ, 1992. *Procedures for Calculation of Aquatic Life Criteria in Louisiana*. S. L. Braden and S. L. Weber. Office of Water Resources, Baton Rouge, Louisiana. December 11, 1992.

²⁴ EPA. 1984. Ambient water quality criteria for cadmium, copper, lead and mercury. EPA 440/5-84.

²⁵ EPA. 1986. Ambient water quality criteria for nickel. EPA 440/5-86-004.

²⁶ Stephan, C.E., D.E. Mount, D.J. Hansen, J.H. Gentile, G.A. Chapman and W.A. 1985. Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses. EPA Office of Research and Development, Environmental Research Laboratories. Duluth, MN. Narragansett, RI. Corvallis, OR. 98pp.

²⁷ EPA. 1989. Recalculation of criteria concentrations for cadmium and copper. Letter from EPA Region 6 to LDEQ, Office of Water Resources, received May 8, 1989.

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Freshwater criteria for some metals depend on the hardness of the water. All of the variations are not listed here in Table 4 below because of space constraints, but the equations for criteria calculation are found in the proposed revisions to LAC 33: IX.1113, Table 1A. The “example” hardness criteria calculations were removed in the proposed revisions, and the conversion factors were incorporated into the equations. The Table 4 (shown below) will list the freshwater standards calculated for a hardness of 100 mg/L CaCO₃.

EPA’s aquatic life recommendations for metals were previously derived using total recoverable metal measurements or measurements expected to give equivalent results in toxicity tests. EPA now recommends that dissolved metals be used as water quality standards as they no longer consider the designation of criteria as dissolved from values derived as total recoverable scientifically defensible. Metals previously adopted as the dissolved form (such as in Louisiana’s Water Quality Standards) now include a conversion factor (CF)²⁸ adopted during the 1998 Triennial Revision. Conversion factors for Arsenic, Chromium III (Trivalent), Cadmium, Copper, Lead, Mercury, Nickel, and Zinc are given in LAC 33: IX.1113, Table 1A. Please note that the CFs for lead and cadmium are also hardness dependent. The water quality standard in LAC 33: IX.1113, Table 1A is calculated by using the appropriate formula multiplied by the conversion factor.

²⁸ Stephan, C.E. 1995. Derivation of conversion factors for the calculation of dissolved freshwater aquatic life criteria for metals. EPA Office of Research and Development, Environmental Research Laboratories. Duluth, MN.

TABLE 4. ACUTE AND CHRONIC AQUATIC LIFE CRITERIA

Compound	Criteria Type	Persistence Class	Freshwater Aquatic Life Criteria				Marine Aquatic Life Criteria		
			Louisiana Species	LC50 Value or (MAV) ug/L	Hardness Dependent	Criteria (ug/L)	Louisiana Species	LC50 Value or (MAV) ug/L	Criteria (ug/L)
Aldrin	National				No	3.0/--			1.3/--
Chlordane	National				No	2.4/0.0043			0.090/0.0040
DDT	National				No	1.10/0.0010			0.130/0.0010
TDE (DDD)	Application Factor	Persistent	Scud	0.6	No	0.03/0.0060	Oyster	25	1.25/0.2500
DDE	Application Factor	Persistent	Planarian	1,050	No	52.5/10.5000	Oyster	14	0.700/0.1400
Dieldrin	National				No	0.2374/0.0557			0.71/0.0019
Endosulfan	National				No	0.22/0.0560			0.034/0.0087
Endrin	National				No	0.0864/0.0375			0.037/0.0023
Heptachlor	National				No	0.52/0.0038			0.053/0.0036
Hexachlorocyclohexane (gamma BHC, Lindane)	National				No	5.30/0.21			0.16/--
Polychlorinated Biphenyls, Total (PCB's)	National				No	2.0/0.014			10.0/0.03
Toxaphene	National				No	0.73/0.0002			0.21/0.0002
Benzene	Application Factor	Non-persistent	Bluegill	22,490	No	2249/1125	<i>Palaemonetes pugio</i>	27,000	2,700/1,350
Carbon Tetrachloride (Tetrachloromethane)	Application Factor	Non-persistent	Bluegill	27,300	No	2730/1365	<i>Menidia beryllina</i>	150 mg/L	15,000/7500
Chloroform (Trichloromethane)	Application Factor	Non-persistent	<i>Daphnia magna</i>	28,900	No	2890/1445	Pink shrimp	81,500	8,150/4,075
Ethylbenzene	Application Factor	Non-persistent	Bluegill	32,000	No	3,200/1,600	<i>Mysidopsis bahia</i>	87,600	8,760/4380
1,2-Dichloroethane (EDC)	Application Factor	Non-persistent	Fathead Minnow	118,000	No	11,800/5,900	<i>M. bahia</i>	113,000	11,300/5,650
1,1,1-Trichloroethane	Application Factor	Non-persistent	Fathead Minnow	52,800	No	5,280/2,640	<i>M. bahia</i>	31,200	3,120/1,560
1,1,2-Trichloroethane	Application Factor	Non-persistent	<i>Daphnia magna</i>	18,000	No	1,800/900	---	---	--/--
1,1,2,2-Tetrachloroethane	Application Factor	Non-persistent	<i>Daphnia magna</i>	9,320	No	932/466	<i>M. bahia</i>	9,020	902/451
1,1-Dichloroethylene	Application Factor	Non-persistent	<i>Daphnia magna</i>	11,600	No	1,160/580	<i>M. bahia</i>	224,000	22,400/11,200
Trichloroethylene	Application Factor	Non-persistent	<i>Daphnia pulex</i>	39,000	No	3,900/1,950	<i>P. pugio</i>	2,000	200/100
Tetrachloroethylene	Application Factor	Non-persistent	Bluegill	12,900	No	1,290/645*	<i>M. bahia</i>	10,200	1,020/510

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TABLE 4. ACUTE AND CHRONIC AQUATIC LIFE CRITERIA continued

Compound	Criteria Type	Persistence Class	Freshwater Aquatic Life Criteria				Marine Aquatic Life Criteria		
			Louisiana Species	LC50 Value or (MAV) ug/L	Hardness Dependent	Criteria (ug/L)	Louisiana Species	LC50 Value or (MAV) ug/L	Criteria (ug/L)
Bromoform (Tribromomethane)	Application Factor	Non-persistent	Bluegill	29,300	No	2,930/1,465	Sheepshead minnow	17,900	1,790/895
Methylene chloride (Dichloromethane)	Application Factor	Non-persistent	Fathead minnow	193,000	No	19,300/9650	<i>M. bahia</i>	256,000	25,600/12,800
Methyl chloride (Chloromethane)	Application Factor	Non-persistent	Bluegill	550,000	No	55,000/27,500	<i>Menidia beryllina</i>	270,000	27,000/13,500
1,3-Dichloropropene	Application Factor	Non-persistent	Bluegill	6,060	No	606/303	<i>M. bahia</i>	790	79/39..5
2-Chlorophenol	Application Factor	Non-persistent	<i>Daphnia magna</i>	2,580	No	258/129	--	--	--/--
4-Chlorophenol	Application Factor	Non-persistent	Bluegill	3,830	No	383/192	Sheepshead minnow	5,350	535/268
2,4-Dichlorophenol	Application Factor	Non-persistent	Bluegill	2,020	No	202/101	--	--	--/--
Phenol (Total)*	Application Factor	Non-persistent	<i>Daphnia magna</i>	7,000	No	700/350	<i>P. pugio</i>	5,800	580/290
Benzidine	Application Factor	Non-persistent	Red Shiner	2,500	No	250/125	--	--	--/--
Hexachlorobutadiene	Application Factor	Persistent	Fathead Minnow	102	No	5.1/1.02	<i>P. pugio</i>	32	1.6/0.32
Arsenic	National				No	339.8/150			69/36
Chromium III (Tri)	National, Application Factor				Yes	537/181	Oyster	10,300	515**/103
Chromium VI (Hex)	National				No	16/11			1,100/50
Zinc	National				Yes	117/108			90/81
Cadmium	Modified National (recalculation method)		Louisiana species only		Yes	32/1.03			45.35/10.0
Copper	Modified National (recalculation method)		Louisiana species only		Yes	18/22			3.63/3.63
Lead	National				Yes	65/2.5			209/8.08
Mercury	National				No	2.04/0.012			2/0.025
Nickel	National				Yes	1397/160			--/--
Cyanide	Modified National		<i>Lepomis macrochirus</i>	99.28	No	45.9/5.4			1.0/--
			<i>Pomoxis nigromaculatus</i>	102					
			<i>Micropterus salmoides</i>	102					

Appendix A: Rationale for Subsegment Description/Language Revisions

Text descriptions

Changes in text descriptions were made to:

1. Correct inaccurate descriptions
2. Standardize the format and expressions
3. Provide maximum information in the limited space allowed in the table
4. Make the wording as usable as possible to people who might not have annotated maps available

Guidelines for text changes:

1. General guidelines:
 - a. Replace obsolete **terminology**, especially terms that depend on the user or observer having access to annotated maps. The prime example is the term “segment” which was replaced with “subsegment” in about 1990. The new terminology should be derived solely from features that the observer can see on the landscape or on unmarked USGS topographic maps at the scale of 1:24,000.
 - b. The format for **streams** is “From [the most upstream location within the subsegment] to [the most downstream location within the subsegment]”. For the Intracoastal Waterway, the description is from the westernmost to the easternmost location within the subsegment.
 - c. For **lakes, bays, estuaries and seas**, the name is usually sufficient to describe the location, but an additional phrase may be added for clarity.
 - d. Standards for FWP, PCR, and SCR apply to all water bodies within the subsegment boundary. ONR and DWS standards apply only to the water body specifically named in Table 3 unless otherwise noted.
2. **Highways** are described by their state or federal status in capital letters plus their highway number, with a hyphen between status and number and no other punctuation. The word “highway” (or any abbreviation of that word) is not necessary. Use “clean and simple” format rather than “wordy and elaborate.”
 - a. Examples of preferred format: US-61, LA-10, I-20
 - b. Examples of formats that should not be used: U.S. 61, US Hwy 61, La. 10, LA highway 10, IH-20, IH20, I20, Interstate 20
3. **Parish roads** are described by any recognizable abbreviation of the parish name plus their road number with a hyphen between name and number. It is preferable, however, to use another feature easily recognized on the landscape or on a USGS topographic map (1:24,000 scale), since parish roads are not consistently well marked.
4. **City streets** are described by their state or federal highway designation if possible, otherwise by the name given by the city and obvious on common city maps. Highway designations are preferable, since they seldom if ever change, but names given by the city may change, for example to honor a person or event, but the name change may take a long time to show up on published road maps.
5. Replace **political boundaries**, such as state or parish lines, with other features that can be seen on the landscape or on USGS topographic maps (1:24,000 scale). Political boundaries are usually marked on the landscape only along major roads, but not “in the field” where monitoring teams or other observers need to find the limits of a subsegment.
6. If **measurements** are necessary to describe the edge of a subsegment from a map feature, use miles rather than kilometers, and round to a quarter mile. Measurements may be made with GIS software or manually on paper maps.
7. Spelling and capitalization of **place names** are taken from the Geographic Names Information System (GNIS), which is maintained by the USGS. This is the authoritative agency for place names in the US, and it has provisions for making corrections or changes if given enough evidence that a name is in error. An additional phrase may be added to note an alternate name, such as a local name or an old name. If no official name is found, use the name of the main branch of the tributary.